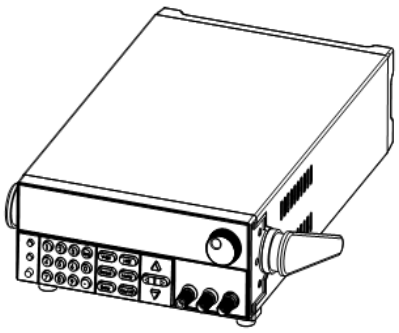
USER'S GUIDE

Programmable DC Power Supply
Model IT6900A Series
Model IT6922A/IT6932A/IT6942A/IT6952A/IT6953A



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IT6900A Series Programmable DC Power Supplies

Security

Please do not install replacement parts in the instrument, or perform any unauthorized modification. Please send the instrument to our company's maintenance department for maintenance, to ensure its security features.
Please refer to the manual for specific information warning or precautions to avoid personal injury or equipment damage.
There is no part that the operator can maintenance. If maintenance service is required, please contact a trained service personnel.

Security regulation

To prevent electric shock, non-authorized personnel is strictly not allowed to open the machine.
This equipment is strictly prohibited for use in life support systems or any other device with security requirements.
We cannot accept responsibility for any direct or indirect financial damage or loss of profit that might occur when using the electronic load.

Safety symbols

Warning

It reminds the user, note some operating procedures, practices, conditions and other matters, that may lead to human casualties.

Notes:

It reminds the user of some operating procedures, practices, conditions and other matters that may result in instrument damage or data lose for ever.

Connect it to safety earth ground using the wire recommended in the user manual.

The symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

High voltage danger

Certification and Quality Assurance

IT6900A series programmable DC power supply fully meet all of the technical specification in the manual.

Warranty

Our Company give one year warranty for the materials and manufacturing of the product since the date of shipment.

Warranty Service

For the warranty service or repair the product, the product must be returned to the designated maintenance units. Return the product to us for warranty service, the customer should pre-pay the one-way Freight to the maintenance department. and our company is responsible for the return shipping cost.
If products are returned from other countries for maintenance service, then the customer should pay all freight, duties and other taxes.

Guarantee limit

The guarantee does not apply to the damage caused by the following conditions:
Improper or inadequate maintenance to the products by customer;
Customers use their own software or interface;
Unauthorized modification or misuse;
Operate this product not in the specified environment, or at the wrong place configuration and maintenance.
Damage from Customer self-installation of circuit, or defects due to customers use their products .
Product model or serial number of the fuselage has been altered, deleted, removed or made illegible;
Damage caused by accidents including but not limited to lightning, water, fire, abuse or neglect.

Notice

If the contents of this manual is subject to change, we will not notice additionally

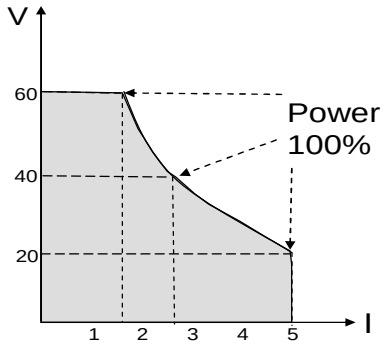
Introduction

IT6900A series power supplies are high performance single-output programmable DC power supplied with communication interface. This series of programmable DC power supply can output the maximum voltage or current with a fixed power for customers. Take IT6922A (60V/5A/100W) for example, when you select 60V for the output voltage, the output power of IT6922A is 100W , so in this case the maximum output current is 100W/60V = 1.66A. When you select 20V for the output voltage, the maximum output current 100W/20V = 5A, but when the output voltage is down to 10V, due to IT6922A maximum current is 5A, so in this case the maximum output current is 5A. IT6900A series power comes with a standard communication interface RS232/USB/GPIB, both desktop and system-based features, can be designed and tested according to your needs and provide multi-purpose solutions.

Convenient bench-top features:

- High visibility vacuum fluorescent display (VFD)
- Digital keyboard operation
- High accuracy and high resolution
- Low ripple and low noise

- Intelligent fan control, energy conservation, noise reduction
- Standard communication interface RS232/USB/GPIB
- Can be monitored by computer software
- Output voltage and current values accordance with procedure
- Can use the knob to adjust the voltage and current
- Can adjust the numbers steps using the cursor
- Rich SCPI orders to facilitate the formation of intelligent test platform
- Can set the output timer(0.1 ~ 99999.9 s)



IT6922A output curve figure

Chapter1 Inspection and Installation

Power supply is a high level safety equipment, there is a protected ground terminal. Before Installation or operation, please read the safety signs and instructions in this manual

1.1 Inspection

After received the power supply, follow these steps to check it:

1. Check for damage in the equipment during transport

If it is the frame, panel damaged, or abnormal working, ext. Please contact immediately with our authorized dealer or service department. Do not return the instrument before positive response has not been got.

2. Check the attachment

Make sure you receive the power and the following components at the same time, if any missing, please contact your nearest dealer.

□ a power cord (in accordance with the standard voltage used in the region)
□ an operating manual.
□ a factory calibration report

□ a certificate

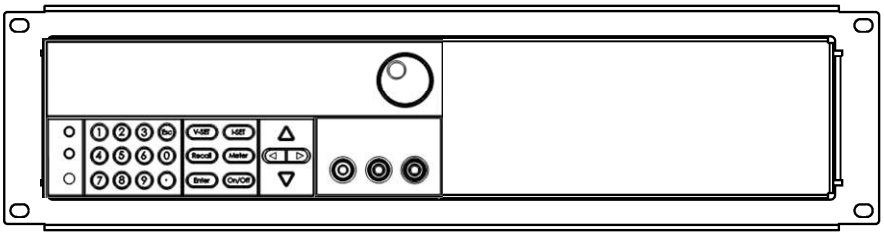
3. The power input requirements

there are two kinds of working voltage for the power supply: 110V and 220V, so please pay attention to the working input voltage. There is a power cord which matches with your local power in the attachment. If that does not match, please do not hesitate to contact with our authorized dealer or service department.
AC input levels (select by change the power switch on the rear panel)
Option Opt.01: 220VAC ± 10%, 47 to 63 Hz
Option Opt.02: 110 VAC ± 10%, 47 to 63 Hz

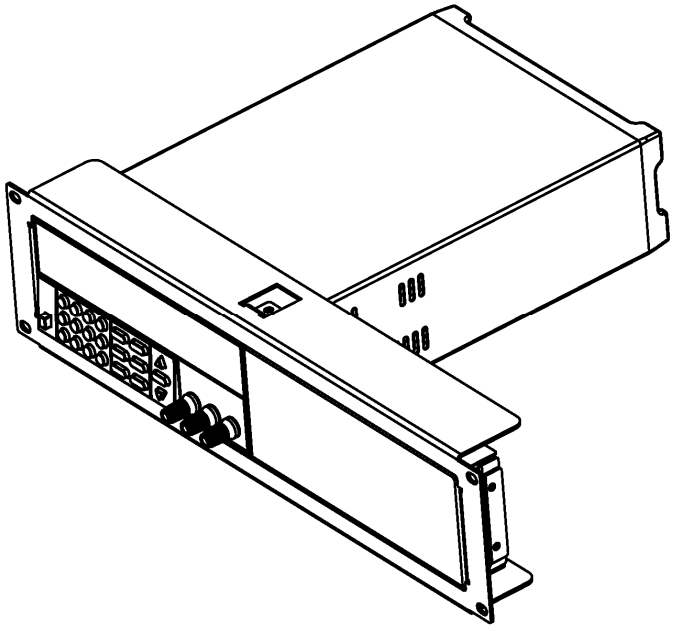
1.2 To Rack Mount the Instrument

You can mount the power supply in a standard 19-inch rack cabinet using the IT-E151 rack mount kit.

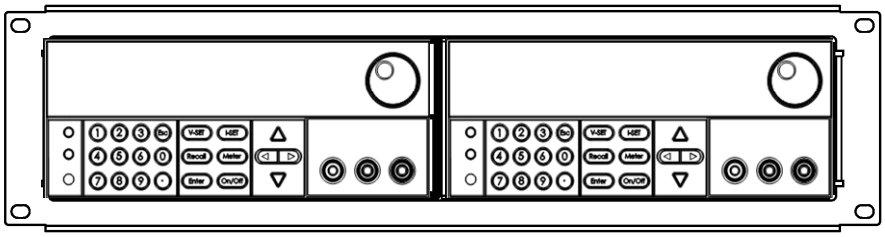
Note: Remove the carrying handle and the two plastic ears before rack-mounting the instrument. To remove the handle, grasp the handle by sides and pull outwards and rotate it to a special position to let the arrow on the handle and the arrow on the plastic ears be in opposite directions, then pull the handle outward. After removing the handle, you can use a screwdriver to remove the two plastic ears.



To rack mount a single instrument, order rack mount kit IT-E151



Side view of rack mounting a single instrument



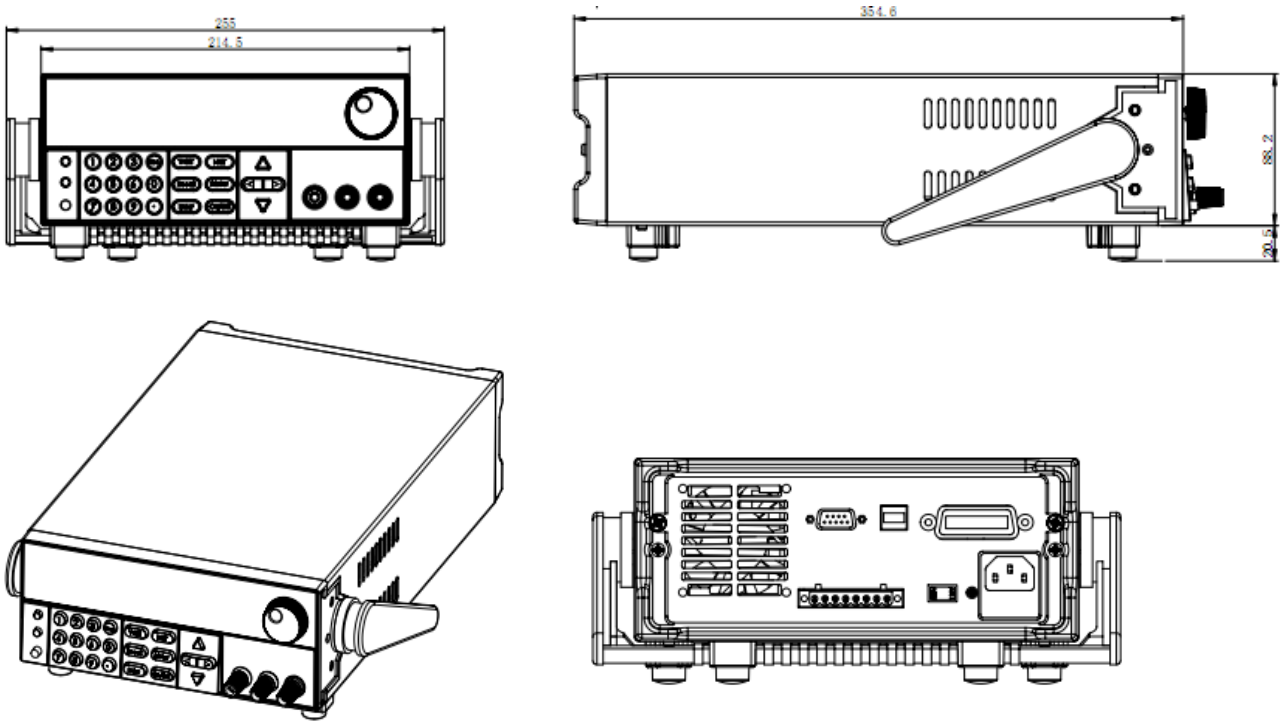
To rack mount two instruments side-by-side, order rack mount kit IT-E151, you needn't to use the front cover panel.

1.3 The size of the power supply

1. IT6900A（IT6922A/IT6932A/IT6942A）power supply's size

214.5mmW×88.2mmH×354.6mmD

*refer to the Dimensions below:



Unit：mm

IT6900A（IT6922A/IT6932A/IT6942A）power supply's dimensions

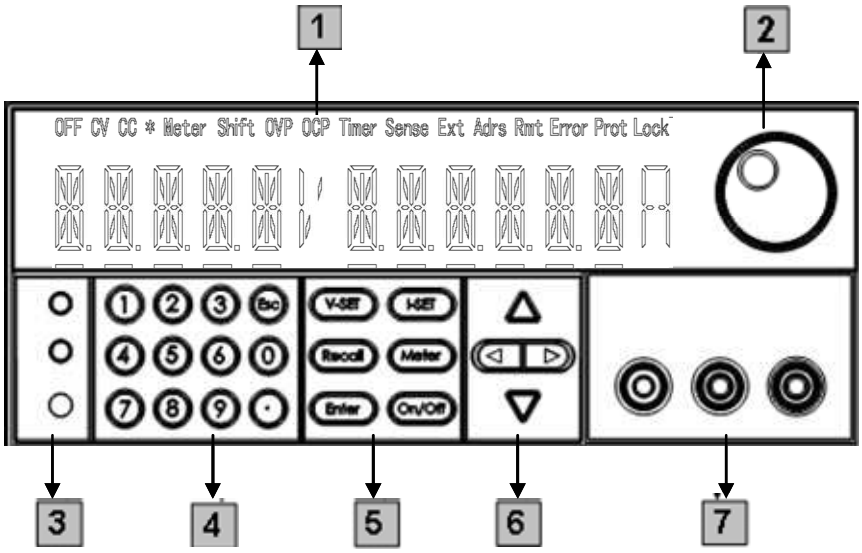
2. IT6900A （IT6952A/IT6953A）is Lengthened, the size of it is:

214.5mmW×88.2mmH×445mmD

Chapter 2 Quick Start

This chapter introduces the front panel, the rear panel, key functions and VFD display function of the power supply, make sure that you can quickly know the appearance, instruction and the key function before you operate the power supply, Help you make better use of this series of power supply.

2.1 The front and rear panel description



1 VFD display

2 Rotary knob

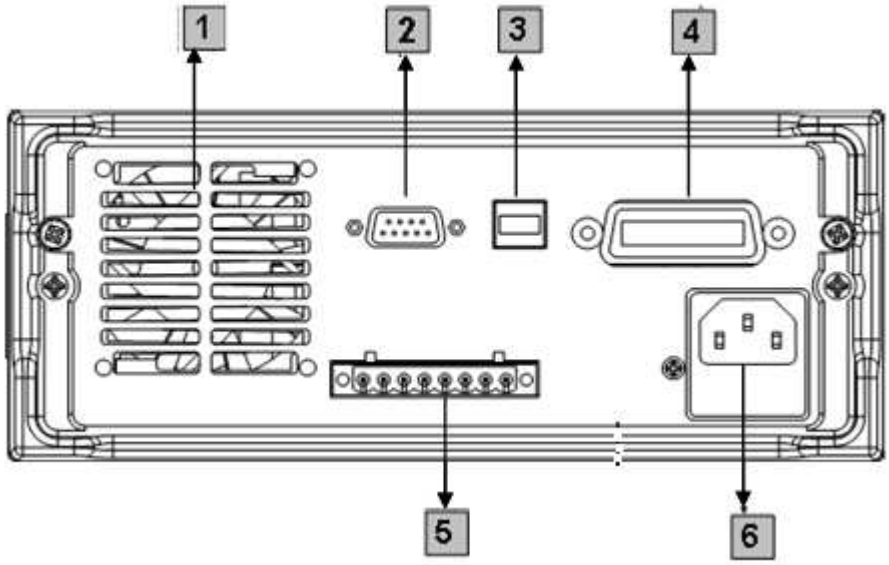
3 Compound key, the local switch key and power switch

4 Number keys and ESC

5 Function keys

6 UP、DOWN, LEFT and RIGHT key, to move cursor

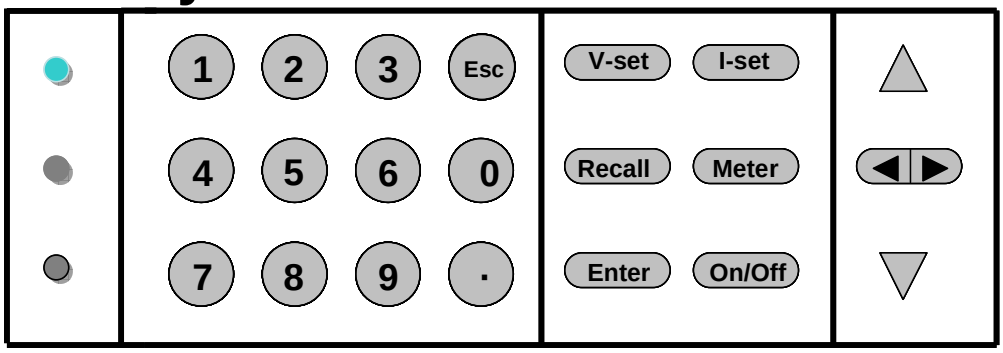
7 Output terminals



1 Cooling window
2 RS232 Communication cable interface
3 USB Communication cable interface
4 GPIB Communication cable interface
5 DVM input terminal，Remote measurement terminal and the output terminal
6 AC power socket（fuse contained）

Note: the AC power switch is at the bottom of the power supply.

2.2 Key introduction

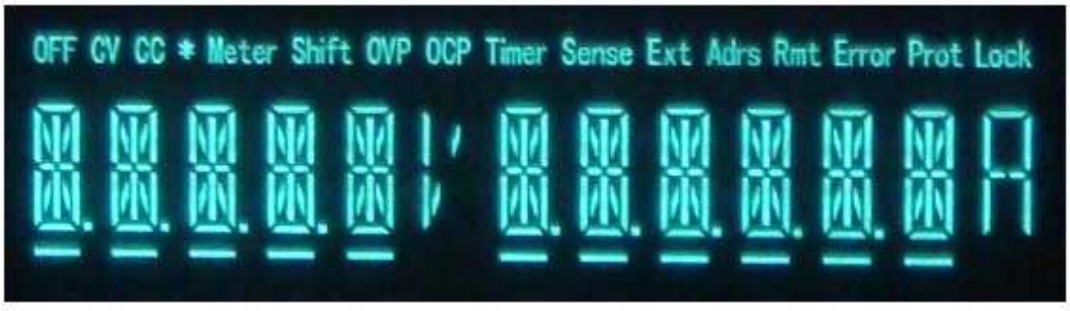


Key description, see the table below:

Keys	Name and the function
Shift	Compound key，co-work with OVP、Menu、Save、DVM、Trigger、Lock
Local	Local switch key, switch from remote mode to local operation mode

Power	Power on key
0-9	Numeric keys
V-set OVP	Voltage set key, set the output voltage/over voltage protection point for the power supply
I-set Menu	Current set key, set the output current/menu function key, to set the relevant Parameters for the power supply
Recall Save	Callback key to call up a set value of system parameters already stored / storage key, to save system parameter settings
Meter DVM	Meter key, to switch from value set panel and the actual output value display / voltage meter function keys, to switch to the measure state of the voltage meter
Enter Trigger	Enter key, to confirm the number entered and operation / trigger button, which is used to trigger the List test.
On/Off Lock	Output on (off) keys, control power output state / keypad lock function keys, used to lock the panel buttons
◀ ▶	Left and right movement keys, used to set the value, to adjust the cursor to the specified location
△ ▽	Up and down keys, used to select a item in the menu or increase (decrease) the output voltage or current values
Esc	Cancel /return keys

2.3 VFD Description



char	Function description	char	Function description
OFF	Output is off	**Timer**	Output on timer function is ON
CV	The power supply is in constant voltage mode	**Sense**	No
CC	The power supply is in constant current mode	**Ext**	No
*	No	**Adrs**	（USB GPIB）light when the address match or (RS232)

			received order
Meter	“Meter” on state	**Rmt**	The power supply is in remote mode
Shift	Use compound keys	**Error**	The power supply has error or fault
OVP	OVP function state on	**Prot**	OVP OTP Protection
OCP	No	**Lock**	Key operation is locked by Password

Chapter 3 power on check

This chapter will introduce the procedure of power on check, including pre-check and output check, to make sure the power supply can power on and work normally on the original state.

3.1 power on Pre-check

Power on pre-check includes two parts: power on the supply and system self check.

1. Power on the supply

If Power Supply Does Not Turn On

Use the following steps to help solve problems you might encounter when turning on the instrument. If you need more help, refer to chapter 6 for instructions on returning the instrument to the supplier for service.

(1)Verify that there is AC power to the power supply.

First, verify that the power cord is firmly plugged into the power receptacle on the rear panel of the power supply. You should also make sure that the power source you plugged the power supply into is energized. Then, verify that the power supply is turned on.

(2) Verify the power-line voltage setting.

The line voltage is set to the proper value for your country (110VAC or 220VAC) when the power supply is shipped from the factory. Change the voltage setting if it’s not correct.

(3)Verify that the correct power-line fuse is installed.

If the fuse was damaged, please see the table below to replace the fuse for your

power supply.

Model	Fuse Specifications （110VAC）	Fuse Specifications （220VAC）
IT6922A	T4A 250V	T2A 250V
IT6932A	T6.3A 250V	T3.15A 250V
IT6942A	T12.5A 250V	T6.3A 250V
IT6952A		T10A 250V
IT6953A		T10A 250V

(4)How to exchange the fuse

Open the small plastic cover below the power supply input socket on the back panel with a screwdriver, and you can see the fuse in it, please use the specifications in line fuse.

2. System self-check

After power on normally, the supply will enter self check test first.

About 1 second later，If the EEPROM was damaged or the latest operation data in EEPROM was lost, the VFD will display as below:

EEPROM FAIL

If the last power status in EEPROM is lost, then VFD will display information (about 1 S) as below:

SYST LOST

If the calibration data in EEPROM is lost, then VFD will display (about 1S) as below:

CAL LOST

If the factory calibration data in EEPROM is lost, and then the VFD will display(about 1 S) as below:

FACT LOST

If the power supply is normal, then VFD will display the output voltage and current status as below:

OFF

0.000V 0.0000A

Warning: The power supply is shipped from the factory with a power-line cord that has a plug appropriate for your location. Your power supply is equipped with a 3-wire grounding type power cord; the third conductor being the ground. The power supply is grounded only when the power-line cord is plugged into an appropriate receptacle. Do not operate your power supply

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3.2 Output Checkout

The following procedures check to ensure that the power supply develops its rated outputs and properly responds to operation from the front panel.

■ Voltage Output Checkout

The following steps verify basic voltage functions without load.

1) Turn on the power supply.
2) Set the current value(≥0.1A).
3) Enable the outputs
   Press On/Off key to let the ON annunciator and the CV annunciator turn on to light.
4) turn on Meter mode, press the METER key to light the button, the Meter status Mark lights on the display is turned on.
   Notice: if the voltage value flash, then the power supply is in Set mode, ‘‘Set mode’’ means that the VFD display shows the setting output voltage and current. Or the power supply is in Meter mode, ‘Meter mode” means that the VFD display shows the actual output voltage and current.
5) Set the voltage for the power supply
   Set different voltage values, check the voltage value displayed on the VFD is close to the voltage value you set, and to check if the VFD displayed current value is nearly zero.

6）Ensure that the voltage can be adjusted from zero to the full rated value

■ Current Output checkout

The following steps check basic current functions with a short across the power supply’s output.

1) Turn on the power supply
2) Press On/Off key to ensure that the output is disabled. At the same time, the OFF status mark is on the VFD.
3) Connect a short across(+) and (-) output terminals with an insulated test lead, use a wire sufficient to handle the maximum current.
4) Adjust the voltage value to 1V.
5) Turn on the power output.
   Press On/Off key to ensure the output is enabled, at the same time there is CC status sign on the VFD.
6) Turn on METER function key.
   Press METER key to light it, and the METER status sign is on the VFD.
7) Adjust the current value
   Set some different current values, check whether the voltage value on VFD

is near 0v, and the current on it is close to the value you set.

8) Make sure that the current can be adjusted from 0 to full rated value.
9) Turn off the output of the power supply, and remove the short wire.

Chapter4 technical specification

This chapter will introduce the main technical parameters of IT6900A,such as rated voltage/current/power and so on. Besides, we will introduce the working environment and storage temperature.

4.1 main technical parameters

Parameters		IT6922A	IT6932A	IT6942A	IT6952A	IT6953A
Rated values (0 ℃~40 ℃)	voltage	0 ~60V	0 ~60V	0~60V	0~60V	0~150V
	current	0~5A	0~10A	0~15A	0~25A	0~10A
	power	100W	200W	360W	600W	600W
Load regulation ±(%of output+offset)	voltage	≤0.01%+3mV	≤0.01%+5mV	≤0.01%+8mV	≤0.01%+15mV	≤0.01%+15mV
	current	≤0.05%+2mA	≤0.05%+4mA	≤0.05%+6mA	≤0.1%+10mA	≤0.05%+10mA
Line regulation ±(%of output+offset)	voltage	≤0.01%+3mV	≤0.01%+5mV	≤0.01%+8mV	≤0.01%+15mV	≤0.01%+15mV
	current	≤0.05%+2mA	≤0.05%+4mA	≤0.05%+6mA	≤0.1%+10mA	≤0.5%+10mA
Setup resolution	voltage	1mV	1mV	1mV	1mV	1mV
	current	0.1mA	0.1mA	0.1mA	0.1mA	0.1mA
Readback resolution	voltage	1mV	1mV	1mV	1mV	1mV
	current	0.1mA	0.1mA	0.1mA(＜10A) 1mA(＞10A)	0.1mA(＜10A) 1mA(＞10A)	0.1mA
Setup accuracy （within twelve months） (25℃±5℃) ±(%of output+offset)	voltage	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+20mV
	current	≤0.1%+5mA	≤0.1%+10mA	≤0.1%+15mA	≤0.1%+25mA	≤0.1%+25mA
Read back resolution （W） (25℃±5℃) ±(%of output+offset)	voltage	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+5mV	≤0.03%+20mV
	current	≤0.1%+5mA	≤0.1%+10mA	≤0.1%+15mA	≤0.1%+25mA	≤0.1%+25mA
Ripple (20Hz ~20MHz)	voltage	≤5mVp-p	≤8mVp-p	≤15mVp-p	≤20mVp-p	≤50mVp-p
	current	≤5mArms	≤6mArms	≤8mArms	≤15mArms	≤15mArms
Sample rate	10HZ/S					
Dimension （mm）	214.5mmW×88.2mmH×354.6mmD				214.5mmW×88.2mmH×445mmD	
weight	7.7Kg				15Kg	

4.2 supplementary characteristic

State register capacity：9×8group operation state suggested calibrationfrequency:1time/year

Radiating mode

Fans

Operation temperature
0 to 40 ℃
Storage temperature
-20 to 70 ℃.
Humidity
Max humidity: 80%

Chapter5 Basic operation

This chapter has several subdivisions：

- Local/remote mode
- Voltage setup
- Current setup
- on/off operation
- Setup value/actual value
- Voltage/current/power adjustment
- Saving operation
- Trigger operation
- Menu operation
- OVP protection function
- Key lock function
- DVM measure function

5.1 Local/Remote Mode

Local button can enable you switch mode from remote to local mode.

After you power on the power supply, unit will default in local mode, all the buttons can be used in this mode. While in remote mode, you can't operate through front panel directly. Local and remote mode can be controlled through PC. In addition, the mode changing will not influence the output parameters.

5.2 Voltage Setup

You can set voltage within the range of rated voltage value. When you press V-set button, the button will be lit. This indicates that you can set voltage. There are three ways to set output voltage through front panel.

The first way: press V-set ,adjust cursor location through ◀ ▶ button,

pressing △ and ▽ will enable you to adjust the setting voltage value.

The second way: press V-set , adjust cursor location through ◀▶ button, adjust rotary knob to change the setting voltage value.

The third way: press V-set button and number key(0 to 9) to set voltage value

5.3 Current Setup

You can set current within the range of rated current value. When you press I-set button, the button will be lit. This indicates that you can set current. There are three ways to set output current through front panel.

The first way: press I-set ,adjust cursor location through ◀▶ button, push △ and ▽ will enable you to adjust the setting current value.

The second way: press I-set ,adjust cursor location through ◀▶ button, adjust rotary knob to change the setting current value.

The third way: press I-set button and number key(0 to 9) to set current value

5.4 On/Off Operation

On/Off button is used to control the output state of power supply. When On/Off button is lit, this indicates the output is in on mode. When output is open, the working state indicator light(CV/CC) will be lit.

Note: make sure you have connected power supply well, then press On/Off button.

5.5 Setup value/Actual value

You can switch the display between setting value and actual value by pressing Meter button. When this button is lit, screen displays actual output value and the indicator light “meter” will be lit on the VFD board. In other words, when the button is not lit, the front panel displays setting value.

5.6 Voltage/Current/Power adjustment

The output current value is determined by output voltage of power supply and electronic load's resistance. Only when the actual current value is lower than the setting current value, can power supply work in CV mode and the will CV indicator light be lit.

If output current is higher than the setting value, then power supply will function in CC mode. And the CC indicator light will be lit.

The output voltage and current value are also influenced by the upper limit of output power. Take IT6932A(60V/10A/200W) for example, suppose you set the max power value to be 200W,then when the setting output voltage and current is 25V/10A,in fact, the unit can only output 25V/8A.

5.7 Saving Operation

Customer can save some often-used parameters in nonvolatile memory. You can use the button + Recall(Save) button or SCPI order *SAV、*RCL to achieve this function. Saving parameters include: setting voltage/setting current

Saving method:

Press + Recall(save) button, and then input the group number you want to save through number key board. Press enter button to confirm. If you want to recall the saved parameters, press Recall button and corresponding group number(number1-9).At last press enter button to confirm.

5.8 Trigger operation

You need to select the trigger mode from the menu before using this function.

After you edit a list file, press + Enter（Trigger）to give a trigger signal. During the running process,Enter button will be lit all the time.

5.9 Menu operation

1 Menu description

Press + I-set(Menu) to enter the menu. You will see a optional items on the screen, through direction keys and rotary knob to upturn VFD display, then the screen will display the following functions .Press Enter button will enter corresponding items. Press ESC button will return to previous menu.

MAX VOLT	**Set the max output voltage**				
SYST SET	**P-MEN（RESET）**	**Reset**	Power is restored to factory setting		
		Keep	Set the power-on state as the last power off state		
	P-OUT (OFF)	**OFF**	Enable the power-on output state to be off mode		
		Keep	Set the power-on output state to be the last power-off output state		
	COMM (GPIB)	**GPIB**	**ADDR**	Address can be set within 0-30	
		RS232	**BAUD**	**4800**	
				9600	
				19200	
				38400	
				57600	
				115200	
			NONE 8BIT	**NONE 8BIT**	
				EVEN 8BIT	
				ODD 8BIT	
			MODE	**SIGNAL**	
				MUX	**ADDR.** Address can be set within 0-30
		USB			
	BEEP (ON)	**OFF**	Close the key sound		
		ON	Open the key sound		
	KNOB (ON)	**LOCK**	Lock the rotary knob function		
		ON	Unlock the rotary knob function		
	TRIG (MANUAL)	**MANU**	Local keyboard trigger		
		BUS	External trigger		
	MEM (GROUP1)	**GRP1-8**	Save and recall operation		
	TIMER SET	**OFF**	Close the timer function		
		ON	Open the timer operation, the time can be set within 0.1-99999.9s		
	RESET	**NO**	keep the original setting		
		YES	restore the factory setting		
	EXIT	Quit the menu setting			
LIST SET	**LIST STATE**	**OFF**	Close list test function		
		ON	Open list test function		
	LIST LOAD	Recall the saved list file（**FILE0-FILE9**）			
	LIST EDIT	**TIME (SEC)**	**SEC**	second	
			MIN	minute	
		VSET	Setup the single step voltage		
		ISET	Setup the single step current		

		SEC	Setup single step delay time(0.1-9999)	
		NEXT (YES)	**YES**	continue the edit of next step
			NO	End up the list file edit
		REPET	**1-65535**	Set the cycle time of list file
		SAVE	**NO**	Unsave the current list file
			FILE0-FILE9	Save the list file to appointed document
	EXIT	quit the system menu		
POWER INFO	**MODEL**	unit model		
	VER	the software version		
	SN-1	the first six number of SN		
	SN-2	the middle six number of SN		
	SN-3	the last six number of SN		
	EXIT	Quit the information menu		
EXIT MENU	Quit the main menu			

Note： **Pressing** ESC button can enable you to quit any function setting.

2. **menu functions**

Maximum voltage set（>MAX VOLT）

The range of setting voltage is from 0V to rated voltage. You can press + I-set (Menu) button to enter the menu, then press direction key to select >MAX VOLT item. Press Enter button to confirm. After you set the max voltage value, the output voltage value can only be set less than the max voltage. Our default max voltage value is the rated value.

Power-on parameters set(>P-MEN)

This item can set power on state of parameters. If you select RESET item, then all the parameters will be initialized to the factory setting. Output voltage and current will always be 0V/0A.Or the output value will be the same with last power off state. The default setting is RESET item.

Power On Output State(>P-OUT)

This item can set the power on output state. If you select **keep** item, that indicates the power on output state is the same with last power off output state. If you select **off** item, unit will automatically in off mode when you power on. Default setting is **OFF** item.

Communication (>COMM)

Our unit has provided three standard communication interfaces: RS232/USB/GPIB.In this option, you can select the communication interface according to your demands. The range of GPIB address is 0-30. Besides, we have multi-baudrate to be chosen in RS232 mode---4800,9600,19200,38400,57600,11.52K.Data bit is 8,Check digit have three choices: NONE,ODD,EVEN.Before you begin to carry out communication,please make sure the configure in our unit agrees with PC configure.

Key Sound Set(>BEEP ON)

This item can set the key sound state.If in on mode,then key sound will be there when you press buttons.If in off mode,the beeper will not make a sound.The default set is in on mode.

Rotary Knob Set（>KNOB ）

This item is used to set rotary knob state.In on mode,you can use this rotary knob to set the output value and overturn the menu items.In lock mode,this knob can't be used.The default setting is in on mode.

Trigger mode（>TRIG ）

Before you running a list file,you need a trigger signal.Thus you must set the trigger mode firstly,in keyboard trigger mode or in external trigger mode.In MANU trigger mode,press + Enter button can generate a trigger signal.In BUS trigger mode,you can only through sending orders to trigger.The default set is MANU option.

Group Set（MEM GROUP）

Power supply can save some often-used parameters in a nonvolatile memory(capacity is 9*8 groups).This function can make the operations more convenient. Customer can save and recall parameters quickly.

GRP1:This indicates saving power supply parameters in 1-9 groups.Press + Recall (Save) and the group number(1-9) can save the parameters in corresponding groups.

GRP2:This indicates saving the parameters in 10-18 groups.Press + Recall (Save)+saved group number(1-9）can save related parameters.Note that the current number "1" represents parameters are saved in 10th groups.Number "2" represents the parameters are saved in 11th groups.

GRP3-GRP8 by parity of reasoning.

Timer Set（>TIMER SET）

This item is used to set the “time on- load” function.In ON mode,the indicator light “Timer” will be lit on the VFD screen.When output of power supply is opened,timer will begin to work,after reaching the definite time,output will be off automatically.If in OFF mode,the timer function will not be enabled.The default set is in OFF option.

Reset（>RESET）

This item is used to reset all items in the menu.If you select >YES,then unit will restored to factory setting.If you select >NO,all setting in the menu will remain unchanged.

List Mode(>List Set)

Before you edit a list file,please set the trigger mode:manual mode.

Press + I-set button to enter the menu,then press direction key to select >SYST SET option,after that please push Enter button to confirm.At last please press direction key to select >Trig MANUAL and push Enter button to confirm.

You can make the output change order by editing every step value of list operation. The parameters you need to edit includes:single-step voltage,single-step current,single-step delay time and whether to go on the next step.Besides,you also need to set the repeat times and save list sequence file.After you finish the editing process,at this time if you receive a trigger signal,power supply will begin to work according to the sequence steps you’ve edited. Now we take five steps for an example:

Operation steps:

1） Press + I-set （Menu）button to enter the menu

2） VFD display >**MAX VOLT**，press ▽ to select >**LIST SET**，press Enter to confirm

3） VFD display >**LIST STATE**，press ▽ to select >**LIST EDIT**， press Enter to confirm

4） VFD display >**TIME SEC**，press Enter to confirm，go to the next step,you

can also through ▽ button to select **>TIME MIN** time unit，press Enter to confirm.

5） VFD display >**VSET 0.000**，press number key 0 to 9 or through rotary knob to set voltage，after that press Enter to confirm.

6） VFD display **ISET 0.0000,** press number key 0 to 9 or rotary knob to set the single-step current, press Enter to confirm.

7） VFD display **SET 0.1**，press number key 0 to 9 or rotary knob to set single-step delay time，press Enter to confirm.

8） VFD display **NEXT >YES**，press Enter to confirm.

9） Repeat the steps from 5) to 8) and set the four steps' voltage/current and delay time separately. When screen display **NEXT>YES** in the fourth step edit process,please press ▽ to select **NEXT >NO,**press Enter to confirm.

10）VFD display **REPET 1，**press number key 0 to 9 or rotary knob to set the repeat times，press Enter to confirm.

11）VFD display **SAVE >NO**，press Enter to confirm，in this circumstance,the list file is not saved but can run for one time,or you can press ▽ button to select **>SAVE FILE0**,saving the list test file in FILE0~FILE9，press Enter to confirm.You can recall the file in the following utilization.

12）If you do not save the list test file,VFD will display **LIST EDIT**;if you select to save the test file,VFD will display **SAVE DONE** for three seconds,and then display **LIST EDITL**.

13）Press △ to select >**LIST STATE item**，press Enter to confirm.

14）**VFD** display **LIST >OFF,** press ▽ to select **>LIST >ON,** press Enter to confirm.Now Enter button will be lit.This indicates that list operation function has been opened.

15）VFD display >**LIST STATE**，pressing Esc button can quit the operation.

16） Press On/Off button to open the output，press +Enter（Trigger）to give a trigger signal.

17） If you have edited several list files,you can select **LIST LOAD** item to recall the file you need.And then press Esc to quit this operation.Press On/Off button to open the output.Now you only need to press +Enter(Trigger) to give a trigger signal,the list file can be ran.

18） In LIST mode,voltage set and current set button can’t be used,In **LIST STATE** item,choose **LIST>OFF** will enable you to quit list mode.

5.10 OVP Function

IT6900A series power supply provide OVP function,press +V-set button can enable you to set the over voltage protection value.Over voltage may caused by internal defect or customer’s incorrect operation(such as output voltage rising),or external voltage too high.Once power supply is protected(OVP),the output will be off immediately and “OVP” indicator light will be lit,the VFD display “OVER VOLT”。

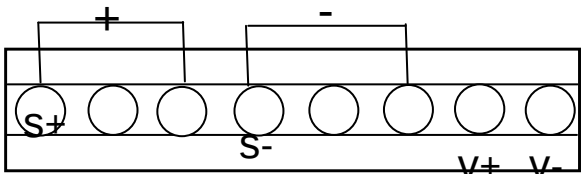
Avoid external voltage that across the output terminals exceeding the 120% of rated voltage or it will damage out power supply!

When power supply in OVP state,please check the external factors first, after you exclude the external factors, press ON/OFF button to open output again.If in communication state originally, you should by sending order OUTP ON order to open output.

5.11 Key Lock

Press +On/Off（Lock）button to set the key lock state.If keyboard has been locked,the indicator light LOCK will display on the VFD screen.In addition,when key board are lock,all butttons can’t be used but ON/OFF、Meter buton、shift button.Press this button once again will relieve key lock function.

5.12 Rear pins function



+，－：output terminals,the same with front pannel output terminals ;

S+，S-：remote sense pins.Disconnect the wires between “+，-”pins if you want to use remote sense function.Then lead a wire from S+，S- pins and connect to the under test objects.

V+，V-:the output interface of a four semi-digital voltmeter.

IT6900A series power supply has four semi-digital voltmeter.This DVM can measure 0.001V to 61.000V voltage.Press + Meter （DVM）button can enable the measured value display on the VFD screen.Press any key to quit the display of this value.

Chapter6 Remote Operation Mode

IT6900A series power supply three standard communication interface: RS232, USB, GPIB, the user can choose to any one of them to implement a communication with the computer.

6.1 RS232 interface

There is a DB9 connector at the rear of the power supply, when connect to computer, you need to connect a cable with COM port on both side;

active connection, you need to set the front panel composite key + I-set key configuration settings the same as computer configuration settings. RS-232 interface can be used to program all of the SCPI orders.

Note： The RS232 settings must match the settings in front panel system information. If any change, please press + I-set key。

RS-232 data format

RS-232 data is a 10-bit words which has a start bit and a stop bit. The start bit and stop bit can’t be edited. However, you can select the parity items with + I-set key on the front panel.

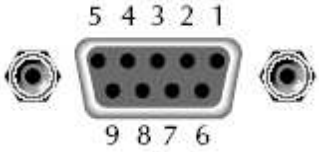
Parity options are stored in nonvolatile memory

Baud Rate

The front panel + I-set button allows the user to select a baud rate which is stored in the non-volatile memory: 4,800,960,019,200 3,840,057,600,115,200

RS-232 connection cable

Use a RS232 cable with DB-9 interface, RS-232 serial port can connect with the controller (eg PC). Do not use blank Modem cable. Table 2-2 shows the plug pins.
If your computer is using a RS-232 interface with DB-25 connector, you need a adapter cable with a DB-25 connector at one end and the other side is a DB-9(not blank modem cable)



RS-232 plug pins

Pin number	Description
1	No connection
2	TXD, transfer date
3	RXD, receive data
4	No connection
5	GND, ground
6	No connection
7	CTS, clear transfer
8	RTS, ready to transfer
9	No connection

RS-232 Troubleshooting:

If there is RS-232 connection problem, check the following:
Computer and power supply must configure the same baud rate, parity, data bits and flow control options. Note that the power configuration as a start bit and a stop bit (these values are fixed).
As described before in RS-232 connector, you must use the correct interface cable or adapter. Note that even if the cable has the right plug, the internal wiring may be wrong.

Interface cable must be connected to the correct serial port on the computer (COM1, COM2, etc.).

Communication Settings

Before communication, you should first make the following parameters of power supply and PC matches.
Baud Rate: 9600 (4800,9600,19200,38400,57600,115200). You can enter the system menu from the front panel, and then set the baud rate.
Data bits: 8
Stop Bits: 1
calibration (none, even, odd)
EVEN 8 data bits, have even parity
ODD 8 data bits have odd parity
NONE 8 data bits, no parity
Local Address: (0 ~ 31, the factory default setting is 0)

Parity=None	Start Bit	8 Data Bits	Stop Bit

6.2 USB interface

Use a Cable with two USB port to connect the power and the computer. All power functions can be programmed via USB.
The USB488 interface functions of the power supply described as below:
interface is 488.2 USB488 interface.
Interface Receiver REN_CONTROL, GO_TO_LOCAL, and LOCAL_LOCKOUT request.
Interface receive MsgID = TRIGGER USBTMC order information, and will pass TRIGGER order to the functional layer.
Power USB488 device functions described as follows:
devices can read all of the mandatory SCPI orders.
device is SR1 enabled.
device is RL1 enabled.
device is DT1 enabled.

6.3 GPIB interface

First, Connect the GPIB interface on the power supply and the GPIB card on computer via IEEE488 bus, must be full access and tighten the screws. Then set the address, the address range of the power : 0 to 30, can set by the function key on the front panel, press the + I-set key to enter the system menu function, find the GPIB address setting by ▼ button, type the address, Enter key to confirm. GPIB address is stored in nonvolatile memory line.

Note: Forbidden to connect DB9 connector in power supply directly with PC or other RS232 port.

Chapter7 Communication protocal

7.1 SCPI order table

IEEE488.2common orders

"*CLS"
"*ESE"
"*ESE?"
"*ESR?",
"*IDN?",
"*OPC",
"*OPC?",
"*PSC",
"*PSC?",
"*RST",
"*SRE",
"*SRE?",
"*STB?",
"*TRG",
"*SAV ",
"*RCL",
"*TST?",
"STATus:QUEStionable[:EVENt]?",
"STATus:QUEStionable:ENABle",
"STATus:QUEStionable:ENABle?"
"STATus:QUEStionable:CONDition?"

System orders

"SYSTem:VERSion?",
"SYSTem:ERRor?",
"SYSTem:REMote",

"SYSTem:LOCal",
"SYSTem:RWLock",
"SYSTem:BEEPer",
"SYSTem:COMMunicate:GPIB:RDEVice:ADDRess",
"SYSTem:COMMunicate:GPIB:RDEVice:ADDRess?",
"SYSTem:INTerface",

Display relevant orders

"DISPlay[:WINDow][:STATe]",
"DISPlay[:WINDow][:STATe]?",
"DISPlay[:WINDow]:TEXT[:DATA]",
"DISPlay[:WINDow]:TEXT[:DATA]?",
"DISPlay[:WINDow]:TEXT:CLEar"

Trigger orders

"TRIGger[:IMMediate]",
"TRIGger:SOURce",
"TRIGger:SOURce?"

Output orders

"[SOURce:]OUTPut[:STATe]",
"[SOURce:]OUTPut[:STATe]?",
"[SOURce:]OUTPut:TIMer[:STATe]",
"[SOURce:]OUTPut:TIMer[:STATe]?",
"[SOURce:]OUTPut:TIMer",
"[SOURce:]OUTPut:TIMer?",

Current control orders

"[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]",
"[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]?",
"[SOURce:]CURRent[:LEVel]:UP[:IMMediate][:AMPLitude]",
"[SOURce:]CURRent[:LEVel]:DOWN[:IMMediate][:AMPLitude]",
"[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]",
"[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]?",
"[SOURce:]CURRent[:LEVel]:TRIGgered[:IMMediate][:INCRement]",
"[SOURce:]CURRent[:LEVel]:TRIGgered[:IMMediate][:INCRement]?",

Voltage control orders

"[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]",
"[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]?",
"[SOURce:]VOLTage[:LEVel]:UP[:IMMediate][:AMPLitude]",
"[SOURce:]VOLTage[:LEVel]:DOWN[:IMMediate][:AMPLitude]",
"[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]",
"[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]?",
"[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]",

"[SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude]?",
"[SOURce:]VOLTage:PROTection[:LEVel]",
"[SOURce:]VOLTage:PROTection[:LEVel]?",
"[SOURce:]VOLTage:PROTection:STATe",
"[SOURce:]VOLTage:PROTection:STATe?",
"[SOURce:]VOLTage:PROTection:TRIPed?",
"[SOURce:]VOLTage:PROTection:CLEar",
"[SOURce:]VOLTage:LIMIT[:LEVel]",
"[SOURce:]VOLTage:LIMIT[:LEVel]?",

Compound control orders

"[SOURce:]APPLy",
"[SOURce:]APPLy?",

Calibration orders

"CALibrate:SECure[:STATe]",
"CALibrate:SECure[:STATe]?",
"CALibrate:INITital",
"CALibrate:SAVe",
"CALibrate:VOLTage:LEVel",
"CALibrate:VOLTage[:DATA]",
"CALibrate:CURRent:LEVel",
"CALibrate:CURRent[:DATA]",
"CALibrate:DVM:LEVel",
"CALibrate:DVM[:DATA]",
"CALibrate:STRing",
"CALibrate:STRing?",

Measure orders

"MEASure[:SCALar]:CURRent[:DC]?",
"FETCh:CURRent[:DC]?",
"MEASure[:SCALar][:VOLTage][:DC]?",
"FETCh[:VOLTage][:DC]?",
"MEASure[:SCALar]:POWer[:DC]?",
"FETCh:POWer[:DC]?",
"MEASure[:SCALar]:DVM[:DC]?",
"FETCh:DVM[:DC]?",
"MEASure[:SCALar]:STATus",

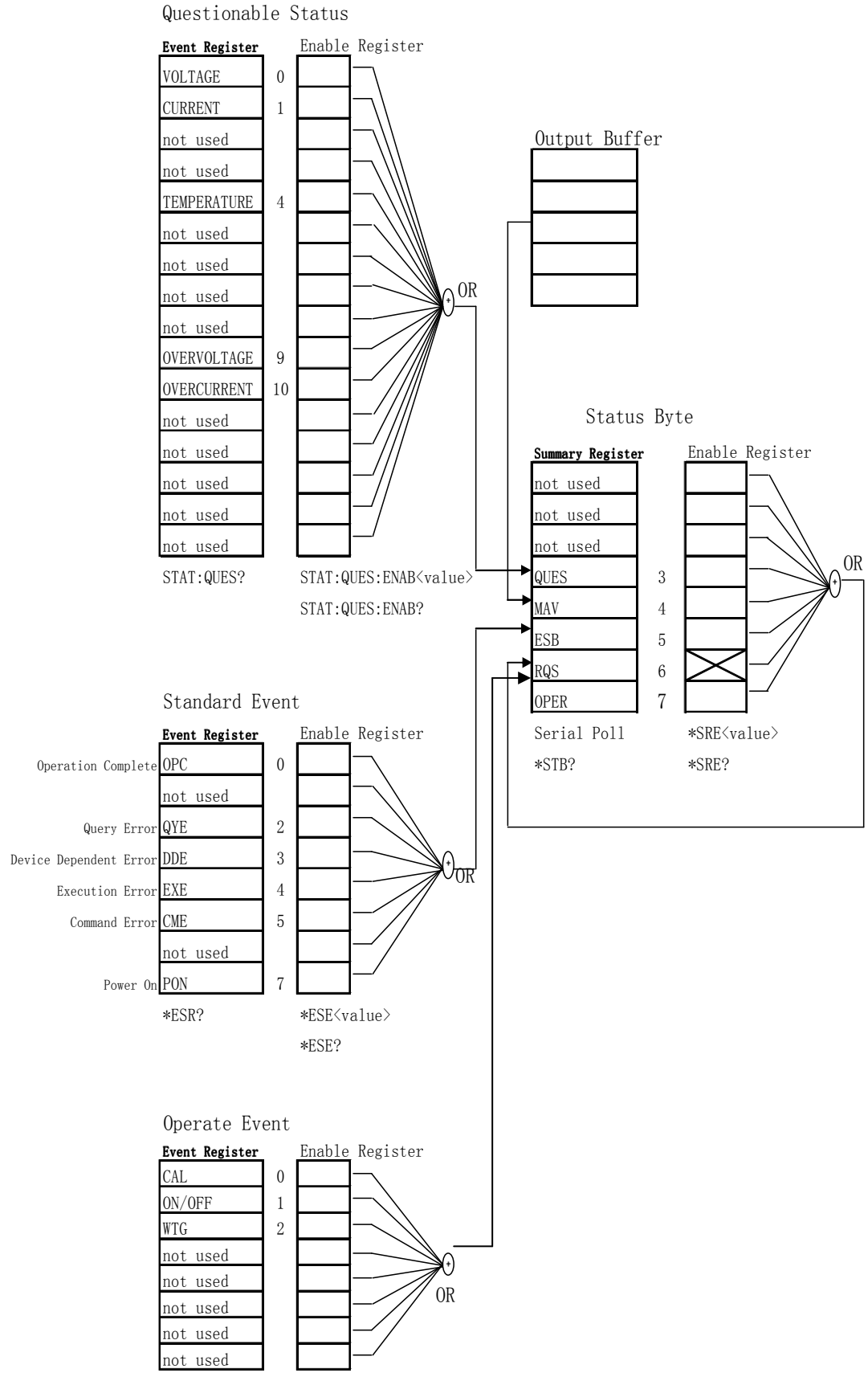
List operation orders

"[SOURce:]LIST:FUNCtion",
"[SOURce:]LIST:FUNCtion?",
"[SOURce:]LIST:LOAD[:IMMediate]",
"[SOURce:]LIST:LOAD[:IMMediate]?",

"[SOURce:]LIST:VOLTage",
"[SOURce:]LIST:VOLTage?",
"[SOURce:]LIST:CURRent",
"[SOURce:]LIST:CURRent?",
"[SOURce:]LIST:TIMEr",
"[SOURce:]LIST:TIMEr?",
"[SOURce:]LIST:SAVE",
"[SOURce:]LIST:REPet",
"[SOURce:]LIST:REPet?"

7.2 SCPI status register

IT6900A series power records variable instrument status via three kinds of status register, the three kinds of registers are standard event register, query status register and status bytes register. Status byte register records the information of other status registers. The below picture will give you more detailed information:



Event register is read only register, used to store the implementation status of the

power, the data used in the event register latches in the form, once the data is stored, subsequent data will be completely ignored. Even can't changed by re-setting order (* RST) or equipment restart.
but if query the data in event register or send clear order *CLS(clear status), the event register will be automatically cleared. The main content which the standard event register records is:
whether power output is turned on, order syntax errors, order execution errors, self-test or calibration errors, query errors and so on.

Bit		Decimal Value	Definition
0	OPC	1	Operation Complete. All orders prior to and including an *OPC order have been executed.
1	Not Used	0	Always set to 0.
2	QYE	4	Query Error. The power supply tried to read the output buffer but it was empty. Or, new order line was received before a previous query had been read. Or, both the input and output buffers are full.
3	DDE	8	Device Error. A self-test or calibration error occurred (see error numbers 601 through 750 in chapter 5).
4	EXE	16	Execution Error. An execution error occurred (see error numbers -211 through -224 in chapter 5).
5	CME	32	Order Error. A order syntax error occurred (see error numbers -101 through -178 in chapter 5).
6	Not Used	0	Always set to 0.
7	PON	128	Power On. Power has been turned off and on since the last time the event register was read or cleared

Query status register provide some information of the power, such as over voltage, over temperature, over current, you can also monitor the change of the constant current and voltage status via the register, for example, data bit 0 is the constant current mode of the power supply, data bit 1 is constant voltage mode of the power supply, and so on.

Bit		Decimal Value	Definition
0	Voltage	1	The power supply is/was in the constant current mode.
1	Current	2	The power supply is/was in the constant

			voltage mode.
2-3	Not used	0	Always set to 0.
4	Over temperature	16	The fan has a fault condition.
5-8	Not used	0	Always set to 0.
9	Over voltage	512	The overvoltage protection circuit has tripped.
10	Over Current	1024	The over current protection circuit has tripped.
11-15	Not used	0	Always set to 0.

Status byte register records the information of other registers. The query data is temporally stored in the output buffer of the power supply, and feedback to customer through BIT4 bit. The data bits in Status byte group will not be latched, when the information in event register is changed, the correspo0nding bit in status byte register will subsequently be changed.

Bit		Decimal Value	Definition
0-2	Not used	0	Always set to 0.
3	QUES	8	One or more bits are set in the questionable status register (bits must be “enabled” in the enable register).
4	MAV	16	Data is available in the power supply output buffer.
5	ESB	32	One or more bits are set in the standard event register (bits must be “enabled” in the enable register).
6	RQS	64	The power supply is requesting service (serial poll).
7	Not used	0	Always set to 0.

7.3 SCPI order description

IEEE488.2 common orders

***CLS**

This order can clean the register as follows::

- Standard event status register
- Quest condition register
- Operation event register
- Status byte register
- Error code

Order syntax: ***CLS**

Parameter: None

***ESE**

This order can set the parameter of standard event enable register. Setting parameter can determine which bit value of standard event register is 1 and the byte will enable ESB of status byte register is 1.

Order syntax: ***ESE** <NR1>
Parameter: 0~255
Reset value: Consult *PSC order
Example: *ESE 128
Quest syntax: ***ESE?**
Return parameter: <NR1>
Reference order: ***ESR?** ***PSC** ***STB?**

***ESR?**

This order can read the value of standard event status register. After executing this order, standard event status register is reset. Bit definition of standard event status register is as the same as the standard event status enable register

Quest syntax: ***ESR?**
Parameter: None
Return parameter: <NR1>
Reference order: ***CLS** ***ESE** ***ESE?** ***OPC**

***IDN?**

This order can read information about power supply. The parameter it returns contains 4 segments divided by comma.

Quest syntax: ***IDN?**
Parameter: None
Return parameter: <AARD>
For example: ITECH Ltd，IT6922A，0123456789AF，1.00

***OPC**

When all orders before this order are executed, OPC is 1 for the standard event status register.

Sending query order will return 1 to output buffer.

Order syntax: ***OPC**
Parameter: None
Quest syntax: ***OPC?**
Return parameter: <NR1>

***PSC**

This order control if power supply send a query or not when it is reset.

1 OR ON: When power supply is reset, operation event enable register, query event enable register and standard event status register are all reset.

0 OR OFF: The data of status byte register, operation event enable register, quest event enable register and standard event status enable register is stored in nonvolatile register, and is recalled when power supply is

reset.

Order syntax: ***PSC <bool>**

Parameter: 0|1|ON|OFF

Quest syntax: ***PSC?**

Return parameter: 0|1

Reference order: ***ESE *SRE STAT:OPER:ENAB STAT:QUES:ENAB**

***RST**

This order reset the power supply to default setting.

CURR CURR:STEP CURR:TRIG CURR:PROT DISP ON OUTP OFF TRIG:SOUR BUS VOLT 0V VOLT:STEP VOLT:TRIG VOLT:PROT VOLT:PROT:STAT ON

Order syntax: ***RST>**

Parameter: None

***SRE<*enabled value*>**

This order can set the parameter of standard event register. When query status bit enable register, the power will return a decimal number, this number is the binary weighted of enable register.

Order syntax: ***SRE** <NRf>

Parameter: 0~255

Reset value: Consult *PSC order

Example: *SRE 128

Quest syntax**: *SRE?**

Return parameter: <NR1>

Reference Order: ***ESE *ESR? *PSC *STB?**

***STB?**

This order can read the data from status byte register.

This order is similar to a statistics of series, but the equivalent of another instrument orders, it returns the value the same as series statistics, but after this order is executed, the bit 6 value of status byte register is cleared, while the status bit will not be cleared when system statistics implemented.

Quest syntax: ***STB?**

Parameter: None

Return parameter: <NR1>

Reference order: ***CLS *ESE *ESR**

***TRG**

When the trigger mode of the power supply is BUS order trigger mode, the order will Generates a trigger signal.

The function is the same as **TRIGger[:IMMediate]**

Order syntax: *TRG
Parameter: none
Reference order: **TRIG** **TRIG:SOUR**

***SAV**
This order can save the parameters of power supply to register. These parameter contains:
CURR CURR:STEP CURR:TRIG CURR:PROT DISP OUTP TRIG:SOUR
VOLT VOLT:STEP VOLT:TRIG VOLT:PROT VOLT:PROT:STAT
Order syntax: ***SAV<NRf>***
Parameter: 1~72
Example: ***SAV** 3
Reference order: ***RCL**

***RCL**
This order can recall the parameter you saved before from the register.
Order syntax: ***RCL<NRf>***
Parameter: 1~72
Example: ***RCL** 3
Reference order: ***SAV**

STATus:QUEStionable[:EVENt]?
This order can read the parameter from quest event register. the power supply will return a decimal number which is corresponding to the binary weighted sum of each bit of the register,, these bits have been latched. After executing, quest event register is reset.
Quest syntax: **STATus:QUEStionable[:EVENt]?**
Parameter: None
Return parameter: <NR1>
Reference order: **STATus:QUEStionable:ENABle**

STATus:QUEStionable:CONDition?
This order can be used to read the value of query condition register and to get the status of the power, if it is CC or CV,. The power supply will return a decimal number corresponding to the binary-weighted sum of each bit of the register. These bits are not latched. If 0 is returned, then the output status of the power is OFF or uncertain. If 1 is returned, then the status is CC mode, if 2 is returned, then the status is CV. If 3 is returned, then there is error occurred.
Quest syntax: **STATus:QUEStionable: CONDition?**
Parameter: None
Return parameter: <NR1>

STATus:QUEStionable:ENABle<*enabled value*>
This order can set the parameter of quest event enable register. The power supply

will return a decimal number which is the binary-weighted sum of the enable register.

Order syntax: **STATus:QUEStionable:ENABle** <NRf>
Parameter: 0~255
Reset value: Consult *PSC order
Example: **STATus:QUEStionable:ENABle** 16
Quest syntax: **STATus:QUEStionable:ENABle**?
Return parameter: <NR1>
Reference order: ***PSC**

System order

SYSTem:VERSion?

This order can query the version of the SCPI order. Returned value is a string like “YYYY.V”,
In which the YYYY is the year of this version, V is the version.

Order syntax: **SYST:VERS?**
Parameter: None
Return parameter: <NR2>
Example：1.00，1991.1

SYSTem:ERRor?

This order is used to query the error information of the power supply. When the error LED lights on the front panel, it tells us that there is one or more hardware or order syntax error happened. There are at most 20 groups of error message.
Send the order once will read one error message from the error queue.

1. Error messages follow the FIFO (first-in-first-out) principle. The first error will be returned first. when you read all the error tips information in the error queue. The ERROR led will turn off. When error occur the buzzer of the power supply will beep once.
2. If more than 20 errors occurred, the last one stored in the queue will be replaced by “-350”, Meaning "too many mistakes.". If the error messages in the error message queue are not read out, the error following will not be saved to the queue. If there is no error message, when read error information, it will return “+0”, meaning “no error”.
3. If turn off the power supply or send “CLS(clear status) order, the error messages in the error queue will be cleared. *RST order will not clear the error messages in the error queue.

SYSTem:REMote

This order is used to set the power supply to remote control mode through the RS232 interface. Except for the Local key on the front panel, other keys are locked and can’t be used. Send or receive orders without first sending the order to configure the remote control may cause unpredictable results.

Order syntax: **SYST:REM**
Parameter: None
Quest syntax: None

SYSTem:LOCal
This order is used to set the power supply to panel control mode through the RS232 interface. After execute this order, all the buttons on the front panel can be used.
Order syntax: **SYST:LOC**
Parameter: None
Quest syntax: None

SYSTem:RWLock
This order is used to set the power supply to remote control mode through the RS232 interface, and LOCAL is not available too. Executing this order will set the power supply to remote control mode ,the same result as order SYST:REM function, the only difference is this order will lock all the buttons on the front panel including LOCAL button.
Order syntax: **SYST:RWL**
Parameter: None

SYSTem:BEEPer
This order is used to test the beeper, after execute this order, the power supply will issue a beep sound.
Order syntax: SYSTem:BEEPer[:IMMediate]
Example: SYST:BEEP

SYSTem:COMMunicate:GPIB:RDEVice:ADDRess
This order is used to set the GPIB communication address.
Order Syntax: SYSTem:COMMunicate:GPIB:RDEVice:ADDRess <NR1>
Parameter: 0-30
Quest syntax: **SYSTem:COMMunicate:GPIB:RDEVice:ADDRess?**
Returned parameter: <NR1>

SYSTem:INTerface
This order is used to switch the communication interface.
Order syntax: SYSTem:INTerface <GPIB|USB|RS232>

Display relevant orders

DISPlay
This order is used to turn on/off the VFD display. When the display is off, the output and will not be displayed on the VFD, at the same time, all the LED except for ERROR led will not be off. When the control mode is local, the display will turn on automatically, press LOCAL button can switch the control mode from remote to

local.
Order syntax: DISPlay[:WINDow][:STATe] <bool>
Parameter : 0|1|OFF|ON
Example: DISPlay 1
quest syntax: **DISPlay?**
Returned parameter: 0|1

DISPlay:TEXT< Reference value**>**
This order is used to display a text on the VFD. TA message can display up to 12 characters, extra characters will be ignored. Commas, periods and semicolons will not be treated as a separate character but will be contained to the character before and display.
Order syntax: DISPlay[:WINDow]:TEXT[:DTAT]
Quest syntax: **DISPlay:TEXT?**

DISPlay:TEXT:CLEar
This order is used to clear the text displayed on the front panel.
Order syntax: DISPlay[:WINDow]:TEXT:CLEar

Trigger orders

TRIGger
This order is used to generate a trigger signal when trigger source is in BUS mode. The function of this order is similar to *TRG
Order syntax: TRIGger[:IMMediate]
parameters: none
related orders: *TRG TRIG:SOUR

TRIGger:SOURce
This order is used to choose the soure of trigger signal.Power supply can receive the signal from front pannel i.e by pressing Trigger button.Or receive a trigger signal by BUS.When you execute order *RST,the trigger mode should be set in MANUAL.
Order syntax: TRIG:SOUR <mode>
parameters: BUS|MANUAL
Query syntax: **TRIGger:SOURce?**
*RST value: BUS|MANUAL

Output orders

OUTPut
This order is used to open or close the output of power supply.When output is off,the voltage and current of power supply is 0V/1mA.
Order syntax: OUTP[:STATe] <bool>

Parameters:0|1|OFF|ON
Query syntax: **OUTPut?**
*RST value: 0|OFF

OUTPut:TIMer
This order is used to set the state of output timer.
Order syntax: OUTPut:TIMer[:STATe] <bool>
parameters: 0|1|OFF|ON
Query syntax: **OUTPut:TIMer?**

OUTPut:TIMer:DATA
This order is used to set output timer's time.
Order syntax: OUTPut:TIMer:DATA <NRf>
parameters: 0-99999.9
unit: S
Query syntax: **OUTPut:TIMer:DATA?**
parameters: <NRf>

Output current orders

CURRent {<*current value*>|MINimum|MAXimum|UP|DOWN|DEF}
This order is used to set the output current.Nomatter what the current range you select currently,the output current is subject to the newest setting value. Besides,MIN and MAX can be used as parameters.MIN represents 0A,MAX represents the max value of the current range.You may send CURR? MIN or CURR? MAX orders to quire the minmun and maximum current wthin the range. DEF represents defaut value,it also can be used to set value.
We can also send CURR UP and CURR DOWN orders to increase or decrease current,the stepping value should be set with order " CURR:STEP".If adjusted value has exceeded the current range,then error information will be return:error-222.
Oder syntax: [SOUR:]CURR[:LEVel][:IMMediate][:AMPLitude] <NRf>
parameters: MIN to MAX
unit: A
*RST value: MIN
Query syntax: **CURRent?[MINimum|MAXimum]**
Return parameters: <NR2>
Example: CURR:STEP 0.01 //set the stepping value to be 0.01A
CURR UP //enable the output current increase value one time
CURR:STEP 0.02 // set the stepping value to be 0.02A
CURR DOWN // enable the output current decrease value one time

CURRent:STEP
This order is used to service for CURR UP and CURR DOWN two orders.It can set

the stepping value of current.Besides, CURR:STEP? DEF order can inquire the stepping resolution of current of this unit.For example,the stepping setting value is 0.01,it represents 10mA.
Order syntax : [SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement] <NRf>
parameters: MIN~MAX
*RST value: the stepping resolution of current of this unit
Query order: **CURRent:STEP?**
Return parameters: <NR2>

CURRent:TRIG{<*current value*>|MINimum|MAXimum}
This order is used to set a current to be triggered.At first,this current value is saved and only when receiving a trigger signal will the power supply output with this current value.Sending order CURRent will not affect the setting value in this order.Sending query order,unit will return the previous setting value.If customer does not utilize order **CURRent:TRIG** at the begining,then the return parameters will be the value you set with order CURRent . CURR:TRIG? MAX or CURR:TRIG? MIN orders will let you know the max and min current you can set.
Order syntax : [SOURce:]CURRent[:LEVel]:TRIGgered[:IMMediate][:INCRement] <NRf>
parameters: MIN to MAX
unit: A
Query syntax: **CURRent:TRIG? [MINimum|MAXimum]**
Return parameters: <NR2>

Voltage control orders

VOLTage {<*volts*>|MINimum|MAXimum|UP|DOWN|DEF }
CURRent {<*current value*>|MINimum|MAXimum|UP|DOWN|DEF}
This order is used to set the output voltage.Nomatter what the voltage range you select currently,the output voltage is subject to the newest setting value. Besides,MIN and MAX can be used as parameters.MIN represents 0V,MAX represents the max value of the voltage range.You may send VOLT? MIN or VOLT? MAX orders to quire the minmun and maximum voltage within the range. DEF represents defaut value,it also can be used to set value.
We can also send VOLT UP and VOLT DOWN orders to increase or decrease voltage,the stepping value should be set with order ” VOLTage:STEP”.If adjusted value has exceeded the voltage range,then error information will be return:error-222.
Order syntax: [SOUR:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <NRf>
parameters: MIN to MAX
unit: V
*RST value: MIN
Query syntax: **VOLTage? [MINimum|MAXimum]**

Return parameters: <NR2>
Example: VOLT:STEP 0.01 //set the stepping value to be 0.01V
VOLT UP //enable the output voltage increase one time
VOLT:STEP 0.02 //set the stepping value to be0.02V
VOLT DOWN //enable the output value decrease one time

VOLTage:STEP {<*value*>|DEFault}
This order is used to service for VOLT UP and VOLT DOWN two orders.It can set the stepping value of voltage.Besides, VOLT:STEP? DEF order can inquire the stepping resolution of voltage of this unit.For example,the stepping setting value is 0.01,it represents 10mV.
Order syntax : [SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement] <NRf>
parameters: MIN~MAX
*RST value: the stepping resolution of voltage of this unit
Query order: **VOLT:STEP?**
Return parameters: <NR2>

VOLT:TRIG{<*volts*>|MINimum|MAXimum}
This order is used to set a voltage to be triggered.At first,this voltage value is saved and only when receiving a trigger signal will the power supply output with this voltage value.Sending order VOLTage will not affect the setting value in this order.Sending query order,unit will return the previous setting value.If customer does not utilize order **VOLT:TRIG** at the begining,then the return parameters will be the value you set with order CURRent . CURR:TRIG? MAX or CURR:TRIG? MIN orders will let you know the max and min voltage you can set.
Order syntax: [SOURce:]VOLTage[:LEVel]:TRIGgered[:AMPLitude] <NRf>
parameters: MIN to MAX
unit: V
Query syntax: **VOLT:TRIG? [MINimum|MAXimum]**
Return parameters: <NR2>

VOLT:PROTection {<*volts*>|MINimum|MAXimum}
This order is used to set the upper limit of over voltage protection point.If the output voltage value is higher than the upper limit of OVP,then we can assume that internal parts has been shorted.Query state register”OV” bit has been set.When power supply is protected,then we can through order VOLT:PROT:CLE to clear the OVP state.
Order syntax: [SOURce:]VOLTage:PROTection[:LEVel] <NRf>
parameters: MIN to MAX
unit: V
Query syntax: **VOLT:PROT? { MINimum|MAXimum}**
Return parameters: <NR2>

VOLT:PROTection:STATe {0|1|OFF|ON}
This order is used to open or close OVP function i.e to set the state of OVP.
Order syntax: [SOURce:]VOLTage:PROTection:STATe
parameters: **0|1|OFF|ON**
query syntax: **VOLTage:PROTection:STATe?**
Return parameters: 0|1

VOLT:PROTection:TRIPed?
This order is used to inquire the execute state of OVP.If the return value is “1”,this represents that the OVP circuit has been triggered and the OVP state does not be cleared.If the return value is “0”,then it represents the OVP circuit does not be triggered.
Order syntax: [SOURce:]VOLTage:PROTection:TRIPed?
Return parameters: 0|1

VOLT:PROTection:CLEar
This order is used to clear the state of OVP.After you excuting this order,the output value will be restored to the previous output and the upper limit of OVP will be keeped.Of course,before you sending this order,you should enable the output voltage lower than the upper limit of OVP.In addition,please note that making sure to remove the external power supply before you sending this order.
Order syntax: [SOURce:]VOLTage:PROTection:CLEar

VOLT:LIMIT <*volts*>
This order is used to set the upper limit of the output voltage.
Order syntax: [SOURce:]VOLTage:LIMIT[:LEVel] <NRf>
parameters: MIN~MAX
unit: V
Query syntax: **VOLTage:LIMIT?**
Return parameters: <NR2>

Compound Control Order

APPLy {<voltage value>|DEF|MIN|MAX} [,{<current value>|DEF|MIN|MAX}]
This order has combined two kinds of orders: VOLTage and CURRent.When sending this order to unit, power supply will output voltage and current according to the current setting of this order.Of course the precondition is the setting value is within the setted range.If not,then a execution error will occur.You can also use DEF、MIN or MAX as the setting parameters.DEF represents factory setting.MIN will enalbe the voltage and current to be 0.MAX will enable the output to be the highest value in the range.
Order syntax: [SOURce:]APPLy <NRf>
parameters: MIN~MAX

unit: V, A
Query syntax: **APPLy?**
Return parameters: <NR2>

Measurement orders

MEASure:CURRent?
This order is used to measure and return output current value
Order syntax: MEASure[:SCALar]:CURRent[:DC]?
Return parameters: <NR2>

FETCh:CURRent?
This order is used to read the latest current to be processed from sampling buffer.When you send this order,then our unit will communicate with PC,and sending the current data to PC.This order will not affect our unit's setting or tigger the measurement operation.It only need the nearest reading it can get,The returned readings will keep the old before it get a new data.
Order syntax: FETCh:CURRent[:DC]?
Return parameters: <NR2>

MEASure[:VOLTage]?
This order can inquire the current output voltage value.
Order syntax: MEASure[:SCALar][:VOLTage][:DC]?
Return parameters: <NR2>

FETCh[:VOLTage]?
This order is used to read the latest preprocessed voltages from sampling buffer.
Order syntax: FETCh[:VOLTage][:DC]?
Return parameters: <NR2>

MEASure: POWer?
This order is used to measure the current output power value.
Order syntax: MEASure[:SCALar]:POWer[:DC]?
Return parameters: <NR2>

FETCh:POWer?
This order can read the latest power value from the sampling buffer.
Order syntax: FETCh:POWer[:DC]?
Return parameters: <NR2>

MEASure:DVM?
This order is used read the the latest measured value of DVM meter and return this value.
Order syntax: MEASure[:SCALar]:DVM[:DC]?

Return parameters: <NR2>

FETCh:DVM?
This order is used to read the latest datas of DVM meter from the sampling buffer.
Order syntax: FETCh:DVM[:DC]?
Return parameters: <NR2>

MEASure:STATus?
This order is used to switch the display of VFD board between actual output state and DVM state.
Order syntax: MEASure[:SCALar]:STATus <DVM|NORMAL>

List operation orders

LIST:FUNCtion
This order is used to select the state of list mode.
Order syntax: [SOURce:]LIST:FUNCtion<0|1>
Query syntax: [SOURce:]LIST:FUNCtion?
Return parameters: 0|1

LIST:VOLTage
This order is used to set the steps of list file and voltage of current step.
Order syntax: [SOURce:]LIST:VOLTage <NRf>
parameters: MIN~MAX
unit: V
Example: LIST:VOLT 1, 3V //set the first step's voltage to be 3V
Query syntax: **LIST:VOLTage?**
example: LIST:VOLT? 1 //inquire the first step's voltage
Return parameters: <NR2>

LIST:CURRent
This order is used to set the steps of list file and current value of current step.
Order syntax: [SOURce:]LIST:CURRent <NRf>
parameters: MIN~MAX
unit: A
Example: LIST:CURR 1, 2A // set the first step's current to be 3A
Query syntax: LIST:CURRent?
Example: LIST:CURR? 1 // inquire the first step's current
Return parameters: <NR2>

LIST:TIMEr
This order is used to set the steps of list file and delay time of current step.
This order is used to set delay time of every steps.
Order syntax: [SOURce:]LIST:TIMEr

parameters: MIN~MAX|MIN|MAX
unit: S
example: LIST:TIME 1,3
Query syntax: **LIST:TIMEr?**
Example: LIST:TIME? 1
Return parameters: <NR2>

LIST:SAVE
This order is used to save the list file to specified memory region.
Order syntax: [SOURce:]LIST:SAVE <NR1>
parameters: 0~9
Example: LIST:SAVE 1 //save the edited list file to the first set of memory region

LIST:LOAD
This order can recall the list file saved before from specified memory region.Sending query orders can inquire which group file you have recalled.
Order syntax: [SOURce:]LIST:LOAD[:IMMediate] <NR1>
parameters: 0~9
example: LIST:LOAD 1
Query syntax: **LIST:LOAD[:IMMediate]?**

LIST:REPet
This order can set the repeat count of LIST steps.
Order syntax: [SOURce:]LIST:REPet <NR1>
Query syntax: **LIST:REPet?**

Calibration orders

CALibration:SECure:[STATe]
Set protection mode enable or disable when calibrating the power supply.
Order syntax: **CALibration:SECure:[STATe]** {<ON|OFF>,[<password>]}
parameters: 0|1|ON|OFF, ‘5811
Example: CAL:SEC 1, ‘5811; CAL:SEC OFF
Query syntax: **CALibration:SECure:STATe**?
parameters: none

CALibration:INITital
This order is used to reset the calibration parameters to default setting.
Order syntax: **CALibration:** INITital
parameters: none

CALibration:SAVe
This order is used to save the calibration parameters in a nonvolatile memory.
Order syntax: **CALibration:INITial**

parameters: none

CALibration:VOLTage:LEVel
This order can set voltage calibration point. P1、P2、P3、P4 must be calibrated orderly.
Order syntax: **CALibration:VOLTage:LEVel <point>**
parameters: P1|P2|P3|P4

CALibration:VOLTage [:DATA] {<numeric value>}
Return actual output voltage value of calibration point.
Order syntax: **CALibration:VOLTage [:DATA] <NRf>**
Parameters: <NRf>
Example: CAL:VOLT 30.0002V

CALibration:CURRent:LEVel
This order can set current calibration point. P1、P2 must be calibrated orderly.
Order syntax: **CALibration:CURRent:LEVel <point>**
parameters: P1|P2

CALibration:CURRent [:DATA] {<numeric value>}
Return actual output current value to calibration point.
Order syntax: **CALibration:CURRent [:DATA] <NRf>**
parameters: <NRf>
examples: CAL:VOLT 3.0002A

CALibration:STRing
Set the calibration information
Order syntax: CALibration:STRing <parameters>
parameters: The longest length is a string including 24 letters i.e related information the customer records during he running the calibration process,such as the calibration time and number of times and so on.
Example: CAL:STR "2005-1-9 20:12"

CALibration:STRing?
Check original calibration information
Query syntax: CALibration:STRing?
Return parameters: calibration information saved in power supply

CALibration:INITital
This order is used to reset parameters to factory default.
Order syntax: **CALibration:** INITital
parameters: none